State of Nevada
Division of Environmental Protection – 08/02

Permit Number NEV 96021 FACT SHEET
Regarding the
Waste Water from E tunnel at the Nevada Test Site

Introduction

The Nevada Operation Office of the National Nuclear Security Administration (NNSA/NV) and the Defense Threat Reduction Agency (DTRA) of the Department of the Defense have jointly applied for a renewal for their permit to discharge waste water emerging from the portal of E Tunnel Nevada Test Site (NTS). The portal of E Tunnel is located at Latitude 37N 11' 15.990" and Longitude 116E 11' 23.632".

In the five years the permit was in effect, the conditions in E Tunnel experienced, with few exceptions, a slow steady change towards an equilibrium. Although the flow (~ 31 L/min) from the E Tunnel discharge system (ETDS), its hydrogen ion activity (pH at 7.4 SU) and specific conductance (437 micro Siemens/cm {µS/cm}) have remained relatively constant, the tritium levels have decreased from 1,101,000 pCi/L to 927,000 pCi/L as anticipated. The gross alpha (21 to 17.3 pCi/L) and gross beta (160 to 62.3 pCi/L) values are also exhibiting decreases over time.

During the same period of time, the groundwater in Well ER 12-1 demonstrated a relatively steady state. The tritium levels in the groundwater are well below the National Drinking Water Standard of 20,000 pCi/L and have remained relatively constant, as have most of the other parameters. The exceptions are the gross alpha and gross beta values, which show a slight decreasing trend.

Based on the stability the results from the monitoring of both the ETDS and Well ER 12-1 indicate, the Division changed the requirements for the sampling frequency on NDWS parameters. The sampling frequency changed from monthly to annually for DTRA and from

every 15th month to every 24th month for NNSA/NV. However, to more closely track a possible breakthrough, the Division has lowered the permissible limit for tritium at the E Tunnel discharge to 1.0 E+6 pCi/L.

The Division sought to simplify and further standardize dated parts of this permit. By changing the tolerance range of the hydrogen ion activity from the Nevada Drinking Water Standards (NDWS) standard to the more stringent State range, the permit conforms to the current GNEV 93001 and other State permits.

The specific conductance is a rapid and inexpensive field measurement. It represents the ion concentration which indicates the characteristics of the discharge and are monitored for changes. The NDWS requirement is to monitor only. In this industrial, non-residential setting, the water from the E Tunnel discharge and Well ER 12-1 is strictly used for monitoring. Therefore, the Division expanded the tolerance ranges for ETDS and Well ER 12-1 to allow for the occasional high value.

Background

E Tunnel is a complex of tunnels and drifts in the volcanic tuff formations of Rainier Mesa, Area 12 of the NTS, and was constructed for underground testing of nuclear devices. Meteoric water, percolating through the pores and fractures of the volcanic tuffs comprising Rainier Mesa, encounters residues and artifacts of the nuclear experiments conducted inside Rainier Mesa and that water conveys some of the radioactive products of those experiments. Some of that contaminated water exits through the portal of E Tunnel.

Defense Special Weapons Agency (DSWA, which later became DTRA) had originally made reasonable attempts to plug the tunnel near the portal, intending to eliminate the discharge. DSWA's attempt at plugging was unsuccessful and further study revealed that the discharge was reducible but could not be eliminated. The effluent rate from the portal has averaged about 30 liters per minute (7.95 gallons per minute) and is expected to continue at that rate.

The non-radiological species in the discharge do not exceed their respective NDWS; the radioactive species do, however, regularly exceed their respective NDWS. The Gross Alpha and the Gross Beta emissions are roughly twice their NDWS, while tritium is roughly 50 times its NDWS.

DTRA evaluated several alternatives to untreated disposal; all are either technically equivalent to the proposed mode of disposal or are economically impractical. The mode for disposal of the discharge is infiltration/ evaporation in unlined impoundments, directing most of the effluent from E Tunnel toward the groundwater regime. These impoundments have been the historic (since October 1958) mode of disposal.

Well ER 12-1 (completed in October, 1991) is some 1500 feet west of the impoundments and topographically down gradient. Static water is encountered at 468 meters (1540 ft) below grade. The average tritium in the well water from the 15 month samples required by the previous permit is below the minimum reporting limits (400 pCi/L in water). This is substantially below the Nevada Drinking Water Standard of 20,000 picocuries per liter (pCi/L). The gross alpha and gross beta activity in the groundwater averaged 5.093 and 4.968 pCi/L, respectively. Although well ER 12-1 was not specifically constructed to monitor the performance of the impoundments, the well's Completion Report does state, "... some of the tritiated fluid may have entered the underlying carbonate rocks." Since the possibility that the infiltrate from the current mode of disposal may be reaching the water table has not been eliminated, the sudden appearance of elevated levels of radioactive nuclides coinciding with elevated levels at the portal would indicate communication between the vadose zone and the groundwater.

Groundwater Protection

Nevada's Water Pollution Control Regulations define a SOURCE as any building, structure, facility, or installation from which there is or may be the discharge of pollutants. All sources within the physical boundaries of the state are eligible for authorization by an individual permit,

by a temporary permit, or by general permit. A permit sets forth conditions and limitations which are protective of the quality of the water of the state, in accordance with the principle of best practical technology economically achievable.

The State of Nevada has adopted a Groundwater Policy which establishes limitations for discharges to groundwater, based upon the presumption that all groundwater, except those in exempted aquifers, are potential sources of drinking water which must be protected from loss of that potential.

The cardinal objectives of a permit are *protection of the water of the state, prevention of groundwater degradation, and adherence to the standard of performance*. Corollary objectives are the operation in conformance with the design specifications, maintenance of the as-built configuration, and the prohibition against treating, storing, or disposing wastes exhibiting a hazardous characteristic above the regulatory limit.

The New Source Performance Standard (NAC445A.243.3b) prescribes for zero discharge conditions where annual evaporation exceeds annual precipitation. According to that standard, discharge to the surface is not authorized under most predictable or reasonably preventable circumstances; however, increments from meteoric events of the 24hr-25yr or greater magnitude may be discharged from a system that is properly managed and maintained.

Rationale for Permit Requirements

A tolerance range is that span within which values are expected to vary. The bracketing values of a tolerance range establish a permissible limit. A permissible limit is that value which may be used to establish that a violation has occurred, i.e., a pollutant in excess of that authorized has been released from the built facilities in a manner that contributes to the degradation of a potential source of drinking water.

The basis for the range of the pH that does not trigger confirmation sampling is taken from

Appendix III of general permit GNEV 93001, which is the Nevada Drinking Water Standard (NDWS). The NDWS tolerance range for pH is 6.5 to 8.5 Standard Units. To conform with the current general permit GNEV 93001, the Division has changed the tolerance range for this permit to 6.0 to 9.0 Standard Units. The monitoring data in the period from 1997 through 2001, a period representing the current hydraulic pattern in E Tunnel, shows the hydrogen ion activity (pH) in the proposed tolerance range.

The basis for the range of the specific conductance that does not trigger confirmation sampling is 3 Standard Deviations from the mean of the 27 values reported in the period from February 96 through June 96. The tolerance ranges from 402 to 470 μS/cm. At the request from DTRA, the Division has changed the range for the E-Tunnel discharge from 400 to 500 μS/cm, because occasional samples exceeded the previous range. The monitoring data in the period from 1997 through 2001, shows the specific conductance falls within the proposed tolerance range. At the request of NNSA/NV, the Division has changed the range for the Well ER 12-1 groundwater from 400 to 1000 μS/cm, because occasional samples exceeded the previous range. The monitoring data in the period from 1997 through 2001, shows the specific conductance falls within the proposed tolerance range.

The permissible limit for tritium at the E-Tunnel discharge is the mean plus 3 standard deviations of the data reported in the period from February through June 96. The tritium burden in the period from 1997 through 2001 has decreased. Because the trend for tritium has decreased over time, a fairly steady state condition, and for analytical cost savings, the Division has changed the frequency of sampling and testing to annually for DTRA and 24 months for NNSA/NV. To offset the possibility of a potential breakthrough from the ETDS, the Division has reduced the permissible limit to 1.0 E+6 pCi/L to provide a more sensitive limit.

Reported values for Adjusted Gross Alpha emissions and for Gross Beta emissions show that both these parameters regularly exceed their NDWS, although by a much lesser multiple than does tritium. For the duration of the permit, tritium is considered an adequate indicator of the radioactive content of the waste water.

One purpose for monitoring the effluent from E Tunnel for species in Table 1 of the permit is to compare the concentrations of the inorganic constituents of interest, including the 3 radiological components , in the groundwater draining from Rainier Mesa through E Tunnel with the profile of the same parameters in the groundwater extracted from Well ER-12-1.

The PERMISSIBLE LIMITS in Table 1 of the permit are derived from the non-degradation policy that in turn is based upon NRS 445A.490.3 which protects potential groundwater sources of drinking water from degradation. The Nevada Drinking Water Standards (NDWS), adopted by the state Board of Health, are appropriate standards in the absence of historic data on the background water quality, against which degradation of unexempted aquifers can be measured. The 3 radiological constituents exceed their NDWS and must therefore be authorized by a permit to discharge or must be prohibited from being discharged. The Permissible Limit in Table 1 of the permit for Gross Alpha and for Tritium are derived from the data reported from January to July 1996. The derivation is the mean of their reported values plus 1 standard deviation from the mean. The Permissible Limit in Table 1 of the permit for Gross Beta is derived from the data reported in the E Tunnel Effluent Characterization Study, conducted in the period from June 1991 to May 1992, and is the mean of those values plus 1 standard deviation. These limits are displayed in Table A, juxtaposed to their respective NDWS. Exceeding a permissible limit is violation of the terms and conditions in the permit, leading first to investigation of the cause and possible corrective actions, followed by modification of the permit or by suitable enforcement action.

The Thresholds in Table 1 of the permit are set at 90 % of the NDWS. Because the groundwater quality was essentially unknown, the Division chose Thresholds lower than a NDWS. The Division suspected that the activities for which E Tunnel was constructed and the historic mode of disposal of the effluent had compromised the local groundwater quality. The NNSA/NV has implemented the Underground Test Area Program to study the regional groundwater. As used in the permit, a threshold is not a regulatory limit but warns that degradation is near and attention needs to be given to the cause or causes. If neither the NDWS nor the threshold is exceeded,

compliance is assumed. If the threshold is exceeded but not the NDWS, compliance is at risk. If a NDWS (Permissible Limit) is exceeded, degradation is assumed and rigorous effort by the permittees must be devoted to alleviating the cause or causes in accordance with the Best Practical Control Technology Economically Achievable.

Table A: E Tunnel Effluent

	June 91 - May 92	June 95 - Nov 95	Feb 96- July 96	July1997 - July 2002	NDWS
Gross alpha	40.1	33.1	35.2	16.8	15
Gross beta	101	not monitored	not monitored	77	50
tritium	233 E + 4	143 E + 4	111 E + 4	92.6 E +4	2.0 E + 4

(note: units are pico Curies per liter)

The permit authorizes the conveyance of the E Tunnel effluent to the evaporation and infiltration structures where the effluent re-enters the subsurface, i.e, into the unsaturated zone. The issuance of the permit with control limits less stringent than the customary limits to prevent degradation is appropriate, since the release of the captured groundwater back into the groundwater of the Rainier Mesa regime is potentially not greatly different from the situation should the seals and plugs have been effective in eliminating the discharge. In addition, the analyses of ER 12-1 from the previous permit indicate the infiltrate from the impoundments has not reached the upper most aquifer.

Several alternative disposal methods have been evaluated; most alternatives involve subsurface disposal. The technology for total evaporation has been considered but is not deemed economical or practical by the applicants at this time. The construction of an infiltration gallery within the E Tunnel complex has also been considered and found impractical under current expectations. Regardless the technology currently applied to the disposal of the effluent, when

the Corrective Action Plan for Corrective Action Unit 99 is completed, the fate of the groundwater beneath Rainier Mesa, including selection of the permanent mode for disposal of the tunnel effluent, will be determined.

Proposed Determination

Based upon the quantity, quality, and location of the discharge, the Nevada Division of Environmental Protection (NDEP) has determined to re-authorize the discharge by issuing Water Pollution Control Permit NEV96021 to the above federal agencies. The tenure of this permit is for 5 years, the maximum allowable period.

Public Participation

Notice of the determination to re-issue the permit has been published in the Las Vegas Review Journal, a newspaper of general circulation in southern Nevada. The Notice invites the public to comment on the condition and limitations expressed in the draft permit and on its supporting documentation. The period dedicated to public participation ends 30 calendar days following the date of publication of the Notice, unless extended by the Administrator. All comments will be considered in making a final determination and all written comments will be evaluated with written response to the issues raised by the responder. During the 30 day period following the opening of the public participation period, any person may request in writing a public hearing. The request must specify the reasons that a hearing is warranted. A public hearing shall be held, following the required advertisement of the hearing, in each case that the Administrator determines a significant public interest warrants a hearing. The hearing must be held in the area appropriately convenient to the location of the discharge.

The application for a permit to discharge and the supporting information is located in the office of the

Nevada Division of Environmental Protection
1771 East Flamingo Road, Suite 121-A

Las Vegas, Nevada 89119.

Arrangements to study the application and its supporting information, including obtaining copies of all or a portion thereof, can be made by telephone during regular business hours (8 A.M. to 5 P.M., Monday through Friday, except holidays). The telephone number is (702) 486-2850.